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ABSTRACT

Previous research related to the economics of higher education has devoted virtually no attention to the economic return for different disciplines or fields of study. The present study examines the relationship between cost and economic return for undergraduate programs of study at one large public institution, the University of Illinois. In the study, cost included institutional costs for instruction and for certain overhead items, while economic return was defined as return to the graduates through their entry job annual salaries. The correlation between the two variables was statistically significant, but less than 25 percent of the variance in median salary was accounted for by program cost. This relatively low level of relationship was further reflected by a considerable range among disciplines in the ratio of annual salary to cost. For some disciplines median annual salary for bachelor's graduates was less than program cost, while for others median salary was more than double program cost. The results clearly indicated that economic return varies greatly across disciplines. Implications of the findings for both institutions and students are discussed.
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HE 010 621

THE RELATIONSHIP BETWEEN PROGRAM COST AND ECONOMIC RETURN: THE CASE OF ONE PUBLIC UNIVERSITY

A Paper Prepared for the Seminar on
"Rate of Return and Benefit--
Cost Analyses in Higher Education"
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ABSTRACT

Previous research related to the economics of higher education has dealt with the issue in a composite sense, with virtually no attention having been given to the economic return for different disciplines or fields of study. The present study has examined the relationship between cost and economic return for undergraduate programs of study at one large public institution. In the study, cost included institutional costs for instruction and for certain overhead items, while economic return was defined as return to the graduates through their entry job annual salaries. The correlation between the two variables was statistically significant, but less than 25 percent of the variance in median salary was accounted for by program cost. This relatively low level of relationship was further reflected by a considerable range among disciplines in the ratio of annual salary to cost. For some disciplines median annual salary for bachelor's graduates was less than program cost, while for others median salary was more than double program cost. The results clearly indicated that economic return varies greatly across disciplines. Implications of the findings for both institutions and students are discussed.

Colleges and universities are experiencing increasing pressures to collect information about the vocational outcomes of their educational programs, with emphasis on the relationships between the kinds of jobs held by graduates and their collegiate majors. The recent upturn in the incidence of vocationally oriented follow-up surveys of graduates indicates that some institutions have acceded to societal pressures to collect such data. To date these surveys indicate that considerable variation exists in vocational adjustment or "success" of college graduates in various curricular areas.

Given these differences in vocational success of graduates, constituencies which play a primary role in funding higher education--state legislatures, state coordinating agencies, private donors, and taxpayers generally--understandably will ask the following kinds of questions: Is society investing in curricular programs which have high rates of economic return? Should there be a reduction in expensive programs that do not realize a proportionately high return?

Pressed with such questions, colleges and universities soon could be obligated to justify their more costly and/or less vocationally effective programs. This need doubtless will call for information concerning the relationships between program costs and economic returns. But what is known about the economic return to an individual from a college education?

RELEVANT PAST RESEARCH

The several studies that have reviewed the economics of education generally have concluded that the returns from education (either stated in

increased lifetime earnings or in percentage returns on investments in education) are significant and that additional educational investments are worthwhile. The highest returns occur at the lowest educational levels, and incremental returns decrease as young persons climb the rungs of the educational ladder. However, the rate of return generally rises where a student stays in school a final year or two to collect the next level diploma. The successful completion of the final year of high school, for example, adds greatly to returns on educational investment.

Schultz (1963) reviewed the work on the economics of education. He described educational costs as public costs (to taxpayers), private costs (to students and their families and to the philanthropists who help support education), and foregone earnings to students. Since most students in the final years of high school and beyond could be gainfully employed if they were not in school, they incur the "opportunity costs" of the amount they would be earning if they were not in school. Schultz did not cover the economics of commercial schools, military education and the like, and he indicated that further study was needed in several areas, including the proportion of educational expenditures that should be considered consumption (an expense without measurable future benefit, as the general enjoyment of college life) versus the proportion that should be considered investment (a capital item with long-term economic benefit).

Becker (1964) enlarged the concept of human capital to other forms of training, including on-the-job training, and to other advances in human capital, as expenditures on health care. These and other expenditures on human capital tend to improve human productivity.

Schultz, Becker, and others computed expected incomes for various investments in human capital. In the period of the 1960's a university

education returned 9 percent or higher on the base of total educational costs, public and private, including foregone earnings. Investments in education were thought to be at least as productive as investments in physical assets.

Denison (1962) reviewed the economic value of education to the nation. Only a portion of the increase in Gross National Product during this century could be attributed to increases in the stock of physical capital. Much of the remainder was presumed to have resulted from increases in the stock of human capital, that ubiquitous inventory of skills and capacities which exists throughout our economy. Without a plentiful supply of such skills, the instruments of a modern, complex, interrelated economy could not be made, maintained, or operated.

Although persons who attend and graduate from college often have higher incomes than those who do not, this alone does not indicate causation. Ability, family economic status, and other factors which also open economic doors to Americans could be the major determinants of the relationship. Wolfle (1971) investigated these factors and reported that the majority of the earnings differential of college graduates over non-graduates--perhaps two-thirds of that differential--was due to differences in education.

In the early post-World War II years only one voice suggested that the nation was producing too many college graduates and that many would be disappointed. Harris (1948) suggested that many in college would not be able to find the jobs normally available to college graduates, and that many would be forced to take jobs previously occupied by those with lesser credentials. The economy instead grew at an unprecedented rate, and vast numbers of graduates were accompanied by the expanded economy and by technical innovations which were unknown a few years earlier. Harris as an educational doomsayer had been demonstrated to have been in error.

More recently many authors and researchers have claimed that rates of return on higher education have fallen and that higher education generally offers reduced opportunities for higher income. Berg (1970), in Education and Jobs: The Great Training Robbery, maintained that the lengthy education that college students endure is not required for most of the jobs that students obtain. Most college graduates, according to Berg, are underemployed. Bird (1975), in The Case Against College , argued much the same thing. Bird claimed that most students are not in college to improve their earnings or other prospects. These young adults, Bird asserted, are superfluous people with no immediate use to the economy who are put out of sight by those who operate the real world. She argued that the rate of return on a college education is below that of a savings account.

Freeman (1976) pointed out that a downturn in the demand for college skills in the United States began in the 1970's; that the economic returns of a college education dropped dramatically in that decade; and that these are long-term trends based largely on an oversupply of graduates. According to Freeman there is little chance that such trends will be reversed with cyclical changes in the economy.

Jencks (1972), in a massive review of the research on the effects of education on young people, concluded that a relatively small portion of the earnings differential of college educated persons versus those without college credentials could be traced to educational effects. Most of the earnings differential was attributed to innate ability, family standing, or to less tangible characteristics such as motivation. These findings differed markedly from those of Wolfle.

The research during the 1970's has resulted in different findings. Witmer (1976), based on his studies of the social rates of return on college

education, claims that those rates have remained consistently high for a period of over thirty years. According to Witmer, despite minor year-to-year variations, the rate of return during the early 1970's was essentially equal to that of the 1960's. He further predicted that the rate of return will rise rather dramatically by the year 2000.

In the area of teacher education at all levels the demand for college credentials is clearly down due to the falling birth rate. In other fields the experts cannot agree, and the value of college credentials must appear to a rational young person to be less clear or more marginal that it once was. Where once the experts, the authors and writers on the subject of the economics of education, agreed with few qualifications that education was a good investment, now the opinions are mixed and contradictory.

The cited studies of the economics of education have treated the problem in a composite sense without consideration of possible differences across academic fields or programs. This approach probably is reasonable through secondary school where programs are not greatly differentiated, except between college preparatory and vocational programs. (In actuality these programmatic differentials in high school often constitute ability level groupings.) But at the post-secondary level many academic programs exist. Those programs might not all have the same rate of return.

Because of the virtual absence of information concerning the economic return for individual programs, and in view of the considerations noted above, it is apparent that post-secondary education needs to begin to examine this issue. The study discussed in the remainder of this paper was designed to address this need. The study dealt with the relationship between economic return and program costs for the University of Illinois. Economic return was defined in the study in terms of the entry job salaries earned by bachelor's

graduates of one calendar year--1975--at the two largest campuses of that institution.

SOURCES OF DATA FOR THE STUDY

Program Costs

The program cost data used in this study were generated by the University of Illinois Program Cost Study.

For over ten years the University of Illinois together with the other public universities in the state has produced a Discipline Cost Study for the Illinois Board of Higher Education. For much of this time the Discipline Cost Study has shown the average cost of producing a credit hour in a department, converted to 4-digit Higher Education General Information Survey (HEGIS) discipline specialties (major fields of study) as well as to the 2-digit HEGIS groupings of discipline specialties. The cost figures show average state appropriation costs per credit hour after all allocations (except retirement, student aid and restricted funds, but including student tuition). The allocated costs include administrative costs, student services, libraries, and operation and maintenance of the physical plant.

During 1976 a second cost study, the Program Cost Study, was added to the effort performed for the Illinois Board of Higher Education. The Program Cost Study develops average costs for each credit hour produced in majors or curriculums that lead to degrees. An induced course load matrix develops the number of credit hours students in any curriculum take in all disciplines. Applying the credit-hour cost for each discipline by student level to the actual courses taken by students in each curriculum develops the total cost of that curriculum by student level for the year involved. The

average cost per credit hour is developed merely by dividing curriculum total cost by the total credit hours, both at the appropriate student level.

In developing the costs for a four-year undergraduate student it is assumed that the student takes 30 semester credit hours for each of four years, for a total of 120 to graduate. For his last two years he takes courses at the cost for the upper division level; for the first two years, at the cost for the lower division level. Since 1976 was the first year that the Program Cost Study was prepared, the program costs used in this study had to be discounted for the effects of inflation (as reflected in the Discipline Cost Study by student level) to reflect FY75, FY74, FY73, and FY72 costs, the four years that most of the graduates in this study spent in school.

Salaries of Bachelor's Graduates

The annual salary data used in this study were derived from a survey of 1975 graduates of the University of Illinois. The salary figures were developed for those graduates who were employed full-time when surveyed.

The survey of 1975 graduates involved all calendar year graduates with valid U. S. mailing addresses. The institution-wide response rate was 66 percent; the rates for the Urbana-Champaign and Chicago Circle campuses, the two campuses included in the study, were 67 percent and 61 percent respectively.

RESULTS

There were sharp differences in salary, the dependent variable, for the 1975 bachelor's graduates of various HEGIS discipline specialties (major fields of study). Among Urbana-Champaign campus graduates, the range of the salary medians for the discipline specialties was $9,000, with a low median salary of $6,000 and a high median of $15,000 (see Table 1). For Chicago

TABLE 1

Median Salary of Bachelor's Graduates of 1975 and
Program Cost for Bachelor's Degrees Granted in FY75:
Urbana-Champaign Campus

HEGIS Discipline Specialty (Major Field of Study)	N[a]	A Median Salary ($)	B Program Cost ($)	Ratio of A to B
AGRICULTURE & NATURAL RESOURCES:				
0101 Agriculture, General	26	11,200	6,545	1.71
0102 Agronomy	8	11,200	6,084	1.84
0104 Animal Science	18	10,750	6,828	1.57
0105 Dairy Science	5	9,000	6,606	1.36
0109 Ornamental Horticulture	16	10,000	5,372	1.86
0111 Agricultural Economics	27	10,800	5,681	1.90
0112 Agricultural Business	15	10,500	5,255	2.00
0114 Forestry	18	7,970	5,892	1.35
ARCHITECTURE & ENVIRONMENTAL DESIGN:				
0202 Architecture	42	9,690	6,001	1.61
0203 Interior Design	16	6,935	6,428	1.08
0204 Landscape Architecture	9	12,000	7,127	1.68
0206 City, Community & Regional Planning	14	9,848	8,204	1.20
BIOLOGICAL SCIENCES:				
0401 Biology, General	67	9,000	6,836	1.32
0407 Zoology, General	11	8,400	7,110	1.18
0411 Microbiology	13	9,300	6,972	1.33
0414 Biochemistry	8	10,650	7,583	1.40
BUSINESS & MANAGEMENT:				
0502 Accounting	152	12,400	4,411	2.81
0504 Banking & Finance	93	10,100	4,447	2.27
0506 Business Management & Administration	72	10,252	4,514	2.27
0509 Marketing & Purchasing	52	11,370	4,412	2.58
COMMUNICATIONS:				
0601 Communications, General	9	10,500	5,829	1.80
0602 Journalism	32	8,260	6,393	1.29
0603 Radio/Television	21	9,000	6,108	1.47
0604 Advertising	35	10,000	5,256	1.90
COMPUTER & INFORMATION SCIENCES:				
0701 Computer & Information Sciences, General	25	12,000	6,339	1.89
EDUCATION:				
0802 Elementary Education, General	92	8,890	6,289	1.41
0812 Education of the Deaf	8	9,625	5,737	1.68
0831 Art Education	11	8,700	6,883	1.26
0832 Music Education	28	8,993	8,582	1.05
0835 Physical Education	40	9,550	5,903	1.62
0837 Health Education	11	9,700	5,659	1.71
0838 Business, Commerce & Distributive Education	6	9,350	4,928	1.90
0839 Industrial Arts, Vocational & Technical Education	22	10,000	6,767	1.48
ENGINEERING:				
0901 Engineering, General	23	13,200	8,175	1.61
0902 Aerospace, Aeronautical & Astronautical Engr.	11	13,000	14,023	.93
0903 Agricultural Engr.	21	13,000	7,863	1.65
0906 Chemical Engr.	19	15,000	9,818	1.53
0908 Civil, Construction & Transportation Engr.	84	13,200	8,953	1.47
0909 Electrical, Electronics & Communications Engr.	109	13,500	8,301	1.63
0910 Mechanical Engr.	49	13,900	9,214	1.51
0913 Industrial & Management Engr.	9	15,000	8,780	1.71
0916 Ceramic Engr.	5	14,100	12,294	1.15
0919 Engineering Physics	5	12,515	6,997	1.79
FINE & APPLIED ARTS:				
1002 Art	20	6,610	7,303	.91
1003 Art History & Appreciation	11	6,500	6,885	.94
1004 Music (Performing, Composition, Theory)	5	7,200	8,834	.82
1007 Dramatic Arts	5	6,000	7,597	.79
FOREIGN LANGUAGES:				
1102 French	16	8,650	6,421	1.35
1103 German	6	6,000	6,314	.95
1105 Spanish	18	8,250	5,873	1.40

TABLE 1--*Continued*

HEGIS Discipline Specialty (Major Field of Study)	N[a]	A Median Salary ($)	B Program Cost ($)	Ratio of A to B
HEALTH PROFESSIONS:				
1220 Speech Pathology & Audiology	7	7,000	5,327	1.31
HOME ECONOMICS:				
1301 Home Economics, General	63	7,540	5,805	1.30
LETTERS:				
1501 English, General	69	7,800	5,401	1.44
1506 Speech, Debate & Forensic Science	20	9,150	5,509	1.66
1509 Philosophy	7	12,000	6,593	1.82
MATHEMATICS:				
1701 Mathematics, General	58	9,940	5,937	1.67
PHYSICAL SCIENCES:				
1905 Chemistry, General	19	11,400	7,788	1.46
PSYCHOLOGY:				
2001 Psychology, General	103	7,800	5,147	1.52
PUBLIC AFFAIRS & SERVICES:				
2103 Parks & Recreation Mgmt.	34	8,850	6,501	1.36
2104 Social Work & Helping Services	15	8,500	5,113	1.66
SOCIAL SCIENCES:				
2201 Social Sciences, General	11	8,925	4,696	1.90
2202 Anthropology	18	7,870	5,893	1.34
2204 Economics	17	10,800	4,896	2.21
2205 History	9	7,900	5,357	1.47
2206 Geography	6	8,914	6,032	1.48
2207 Political Science & Government	29	8,925	5,366	1.66
2208 Sociology	37	8,000	5,348	1.50
Mean		9,894	6,617	1.49
Median		9,625	6,314	1.52
Low		6,000	4,411	.79
High		15,000	14,023	2.81
Range		9,000	9,612	2.02

[a]Number of bachelor's graduates responding to survey. Discipline specialties to which the sample was fewer than five were omitted from the table.

Circle campus graduates, the salary medians ran from a low $6,000 to a high $15,300, a range of $9,300 (see Table 2). Taking both campuses into consideration, the highest median annual salaries were concentrated in the following HEGIS groupings of discipline specialties: agriculture and natural resources, engineering, computer and information sciences, business and management, mathematics, and physical sciences. The lowest economic return was reflected by the discipline specialties in fine and applied arts, foreign languages, home economics, letters, and psychology. (The health professions grouping also reflected a low salary level, but it contained very few graduates.)

The range for program cost, the independent variable, also was large. Average program cost for individual discipline specialties for the Urbana-Champaign campus ran from $4,411 to $14,023, a range of $9,612 (Table 1). The range for the Chicago Circle campus was a smaller but still sizeable $4,898, reflecting a low average of $5,034 and a high average of $9,932 (Table 2). For both campuses combined, the highest program costs occurred in these HEGIS groupings: architecture and environmental design, computer and information sciences, engineering, and fine and applied arts. The lowest program costs were found in business and management, home economics, psychology, and social sciences.

Some positive skewing occurred for each campus for both of the variables. In the case of annual salary, the mean of the medians for the HEGIS discipline specialties was $269 higher than the median of those medians for Urbana-Champaign; the corresponding difference for Chicago Circle was $482. For program cost, the mean of the costs for the various discipline specialties was $303 larger than the median of those costs at Urbana-

TABLE 2

Median Salary of Bachelor's Graduates of 1975 and
Program Cost for Bachelor's Degrees Granted in FY75:
Chicago Circle Campus

HEGIS Discipline Specialty (Major Field of Study)	N[a]	A Median Salary ($)	B Program Cost ($)	Ratio of A to B
ARCHITECTURE & ENVIRONMENTAL DESIGN:				
0202 Architecture	21	10,200	9,875	1.03
BIOLOGICAL SCIENCES				
0401 Biology, General	41	9,000	6,700	1.34
BUSINESS & MANAGEMENT:				
0502 Accounting	97	12,000	5,034	2.38
0504 Banking & Finance	16	10,750	5,111	2.10
0506 Business Management & Administration	48	11,250	5,361	2.10
0509 Marketing & Purchasing	27	9,880	5,184	1.91
COMPUTER & INFORMATION SCIENCES:				
0702 Information Sciences & Systems	18	13,000	7,960	1.63
EDUCATION:				
0802 Elementary Education, General	55	9,300	6,785	1.37
0835 Physical Education	14	9,916	7,958	1.25
ENGINEERING:				
0906 Chemical Engr.	5	15,300	8,548	1.79
0909 Electrical, Electronics & Communications Engr.	24	13,000	8,192	1.59
0910 Mechanical Engr.	7	13,680	9,505	1.44
0913 Industrial & Management Engr.	5	13,260	9,445	1.40
0914 Metallurgical Engr.	7	14,100	9,139	1.54
0915 Materials Engr.	11	13,000	9,932	1.31
FINE & APPLIED ARTS:				
1002 Art	8	6,000	9,548	.63
1099 Fine & Applied Arts, Other	23	9,500	9,323	1.02
FOREIGN LANGUAGES:				
1105 Spanish	7	9,400	5,971	1.57
LETTERS:				
1501 English, General	26	8,200	6,611	1.24
1502 Literature, English	7	9,300	6,582	1.41
1506 Speech, Debate & Forensic Science	25	9,000	6,605	1.36
1509 Philosophy	5	9,100	6,496	1.40
MATHEMATICS:				
1701 Mathematics, General	37	10,500	6,061	1.73
PHYSICAL SCIENCES:				
1905 Chemistry, General	8	10,500	6,837	1.54
1914 Geology	8	9,398	6,536	1.44
PSYCHOLOGY:				
2001 Psychology, General	52	8,638	5,732	1.51
SOCIAL SCIENCES:				
2202 Anthropology	9	7,000	6,266	1.12
2204 Economics	9	11,760	5,617	2.09
2205 History	29	8,200	6,154	1.33
2207 Political Science & Government	26	9,595	6,179	1.55
2208 Sociology	14	8,342	5,548	1.50
2209 Criminology	55	10,104	5,397	1.87
Average		10,380	7,069	1.47
Median		9,898	6,593	1.50
Low		6,000	5,034	.63
High		15,300	9,932	2.38
Range		9,300	4,898	1.75

[a]Number of bachelor's graduates responding to survey. Discipline specialties for which the sample was fewer than five were omitted from the table.

Champaign; at Chicago Circle the mean was $476 above the median. Thus for both variables the skewing was more pronounced for Chicago Circle.

Relationship Between the Two Variables

The scattergrams in Figures 1 and 2 show that the relationship between annual salary and program cost was not high for either campus. This in fact was the case, the rank order correlation coefficients between the two variables for the HEGIS discipline specialties being .462 for Urbana-Champaign and .369 for Chicago Circle. While these coefficients were both significantly greater than zero (at the .05 level for Chicago Circle and the .01 level for Urbana-Champaign), in neither case was as much as 25 percent of the variance in median salary accounted for by program cost.

The modest correlation coefficients in combination with the large variation in both variables suggested that annual salary among the graduates was not a constant function of program cost across the various discipline specialties. An examination of the ratio of median annual salary to program cost, an index of the functional relationship between the two variables, documented that observation. This ratio varied greatly among the discipline specialties at both campuses. For the Urbana-Champaign campus the salary to cost ratio ranged from .79 to 2.81 (see Table 1). At Chicago Circle the range was almost as wide, from .63 to 2.38 (see Table 2). Thus for some discipline specialties median salary for bachelor's graduates was less than program cost, while for others median salary was more than double program cost.

The discipline specialties with relatively high salary to cost ratios typically were high return-low cost programs; those with relatively low ratios were most often low return-high cost programs; and the discipline specialties with intermediate ratios tended toward the high return-high cost and low return-low cost patterns. Thus, the ratio of median salary to program

FIGURE 1
MEDIAN ANNUAL SALARY OF GRADUATES VERSUS PROGRAM COST URBANA-CHAMPAIGN CAMPUS

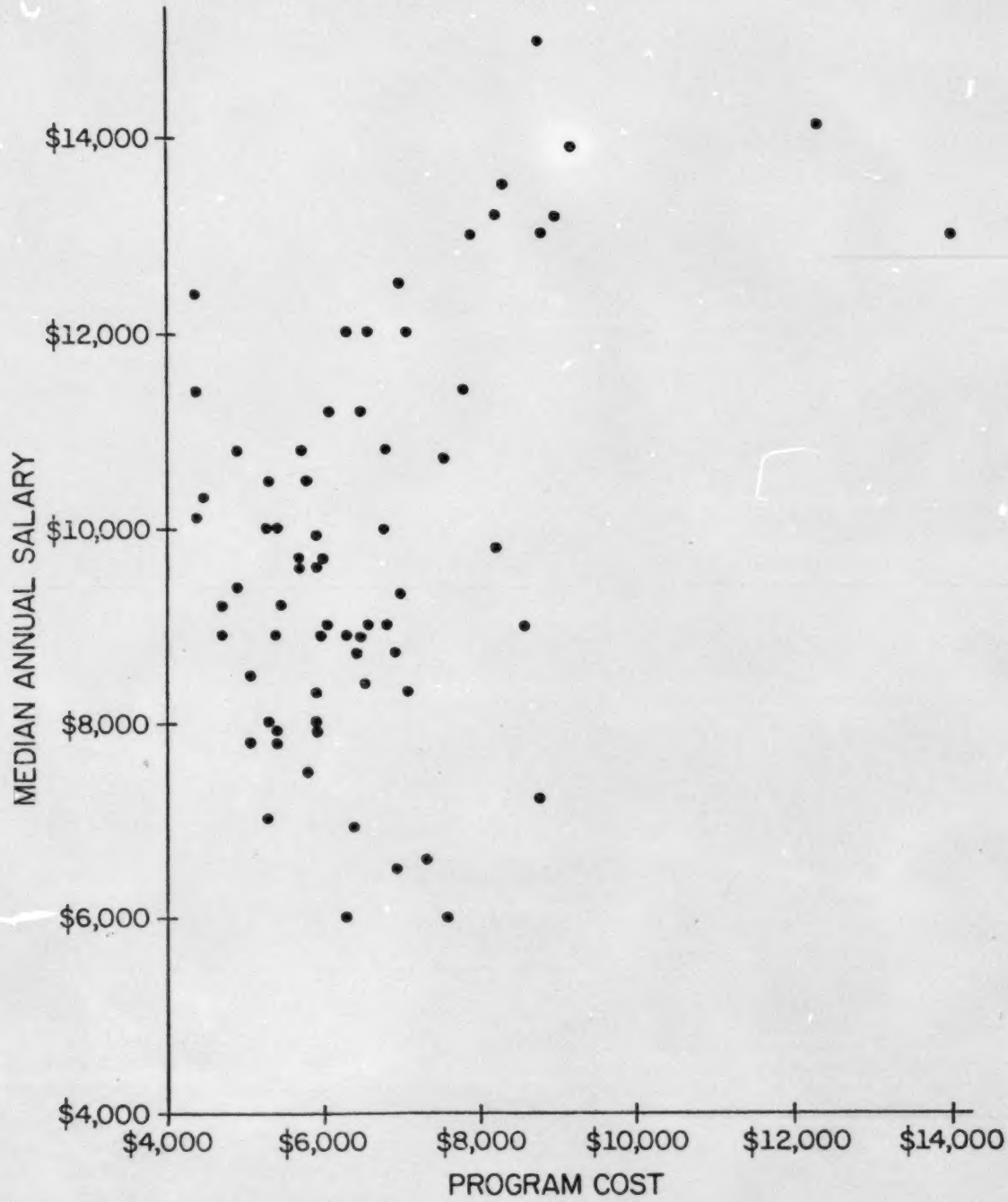
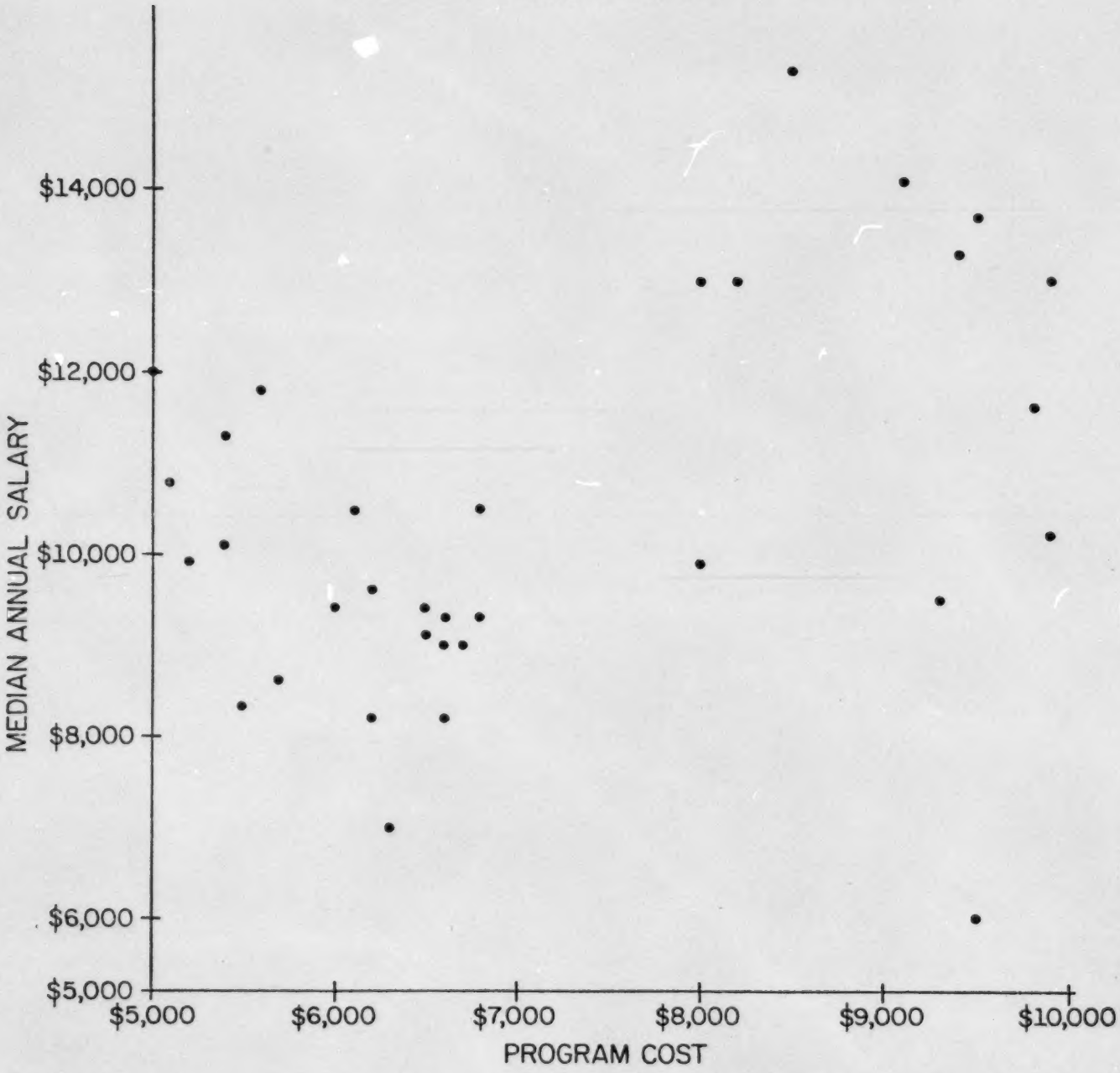


FIGURE 2
MEDIAN ANNUAL SALARY OF GRADUATES VERSUS PROGRAM COST CHICAGO CIRCLE CAMPUS



cost represented a measure of cost effectiveness. The higher the ratio, the more cost effective the program, at least as indicated by the annual salary of graduates.

The most cost effective HEGIS groupings for the two campuses combined were agriculture and natural resources, business and management, computer and information sciences, mathematics, and social sciences. In contrast, the lowest salary to cost ratios occurred for the discipline specialties in the following groupings: architecture and environmental design, biological sciences, fine and applied arts, and home economics. These lowest ratio groupings of course are the ones whose curricula would be most difficult to justify purely from a cost-benefit perspective.

DISCUSSION OF RESULTS

Program cost, as defined in this study, is a function of both faculty salary and class or section size, with the high cost programs having resulted from the use of either high-salaried faculty and/or instructional techniques involving small course sections. The large variation found for program cost was not unexpected. Faculty salaries, being sensitive to market factors, tend to vary greatly across the different discipline specialties represented within an institution. Engineering professors, as an example, generally command higher salaries than do home economics professors. Class size also reflects marked differences among discipline specialties within an institution due to the varied use of lecture, clinical, and laboratory techniques. For instance, one would expect to find smaller average class sizes in fine and applied arts, with its high degree of instructor-student contact, than in social sciences, which is characterized by lecture courses.

The relatively low correlations between economic return and program cost, as well as the large range in the salary to cost ratios, clearly imply that the factors contributing to the variance in the two variables are relatively independent of one another. The little commonality which does exist among these variables probably can be found within the market conditions which affect the salaries of both faculty and graduates. These market conditions obviously do not operate strongly enough to bring about a close relationship between program cost and economic return. This situation is a reasonable one, because few if any discipline specialties are such that faculty actually are in the same job market as bachelor's graduates. A possible exception to this generalization can be iilustrated by a field such as engineering. Most bachelor's graduates in engineering take positions in business or industry. The relatively high salaries of engineering faculty no doubt result, at least in part, by the fact that they can elect to move into industrial employment. Thus, in a restricted sense, both groups are part of the same job market forces.

CONCLUSIONS AND IMPLICATIONS

Two conclusions can be drawn from the results of this study. First, there is no one economic return that can be applied to all of undergraduate post-secondary education. There are, rather, many returns and they tend to vary by discipline specialty. Second, economic return does not bear a constant relationship to cost. For some fields of study, cost is higher than beginning annual salary, while for others the reverse is true.

The results of the study have implications for institutions and students as well as for institutional researchers.

Institutions, in view of the great differences found in the cost effectiveness of academic programs, must be prepared to justify certain programs in other than economic terms. This task will require that institutions give added weight to the non-vocational outcomes of their programs, such as the extent to which those programs have added to the quality of life of graduates. Institutions, especially those that are publicly supported, could find it very difficult to collect information on noneconomic outcomes that is persuasive to their funding constituencies.

The marked variation in economic return across major fields of study has implications for students as well as for institutions. Will students, as such data become more widely available, increasingly opt out of low return programs? If so, should institutions attempt to provide incentives to counter this shift, such as through higher tuition for high return programs? For institutions to do so could lead to some perplexing problems. Relatively low tuition for low return programs might be called for to encourage students to enroll in those programs. But some programs with low economic return also will have relatively high costs. To reduce tuition for such programs clearly could bring about budgeting problems. It is obvious that ready solutions to these problems will be very elusive.

The dramatic variation in rate of return among discipline specialties could prompt researchers to tend more toward the study of the economics of individual programs rather than the economics of higher education as a whole. The data needed for this change in emphasis are becoming more available. Continued study of programmatic rates of return could help to clarify certain of the conflicts and contradictions which have emerged during the 1970's regarding the economics of higher education.

NEEDED ADDITIONAL RESEARCH

The current study deals only with the relationship between program cost and entry job salary. This work should be expanded in several respects.

First, there is need to collect income data at various points during the careers of graduates. The additional salary information provided would make it possible to determine whether the relationships found in this study apply beyond the entry job point. That information also would permit realistic estimates of percentage returns on investment, a meaningful way in which to view economic return.

Second, studies are needed that will take into consideration the private costs of education as well as the public costs which have been included in the present study. Private costs are all the normal costs to the individual of attending college plus an amount for foregone income. A further possible refinement would be the adjustment of public costs to include capital costs and other operating costs omitted from the current study, such as costs of a retirement program. Additional adjustments might also be made to allow for philanthropic giving.

Next, there is need to study the income and career patterns of graduates who do not take jobs directly out of college, but who go on to further education at the graduate or professional levels. For these persons, the total cost of the education at all levels involved could be compared with long-term economic returns. The patterns of economic return doubtless would be altered by such studies. For example, the relatively low initial economic return from biology would be increased considerably over time in view of the large proportion of biology graduates who subsequently receive M.D. degrees.

Finally, studies of economic return should be extended across more institutions to examine the consistency of the relationships and patterns.

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